

Application 10/033,656
Amendment Dated 8 December 2003
Reply to Office Action Mailed 9 September 2003

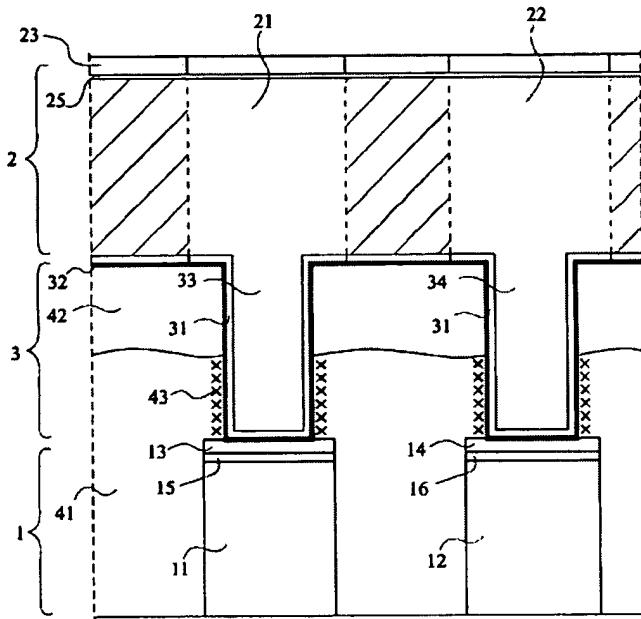
Remarks

Claims 1, 2 and 4–7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,180,520 (“Marty”). Claims 1–7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 5,877,080 (“Aoi”). Claims 8–10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Marty in view of U.S. Patent 5,869,379 (“Gardener”) or Aoi in view of Gardener.

Claim Rejections Under § 102(e) based on Marty.

Claims 1, 2 and 4–7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,180,520 (“Marty”). Claims 1 and 5 are independent; Claims 2 and 4 depend from Claim 1, and Claims 6 and 7 depend from Claim 5.

Marty discloses an interconnect structure having a first metallization level 1 and a second metallization level 2, with vias 33, 34 connecting the two metallization levels. The first metallization level 1 includes two horizontally adjacent metallization “regions” or “portions” 11 and 12. Two distinct insulating layers 41 and 42 are disposed between the metallization levels. Specifically, a first insulating layer 41 having a relatively low dielectric constant contacts the first metallization level 1, while a second insulating layer 42 having a relatively high dielectric constant contacts the second metallization level 2. This structure is illustrated in Figure 1 of Marty, which is reproduced below.



In contrast to the structure disclosed in Marty, Applicant has amended Claim 1 to recite:

Claim 1: An interconnect structure comprising:

a first planar network of electrical conductors formed in a first deposition process;

a second planar network of electrical conductors formed in a second deposition process, and separated from the first planar network by a separation region; and

a single interlevel dielectric material disposed within the separation region and extending into a portion of the first planar network, **without other intervening insulating materials between the first and second planar networks**, the interlevel dielectric material comprising a polysiloxane network consisting essentially of silicon, oxygen, carbon and hydrogen and incorporating carbon-silicon bonding and having a dielectric constant of less than about 3.3.
[emphasis added]

Marty does not teach these limitations. For example, in the Marty structure described and illustrated above, the first planar network of electrical conductors (represented by area 1) is separated from the second planar network of electrical conductors (represented by area 2) by **two distinct dielectric materials**: a spun on glass ("SOG") layer 41, and a tetraethylorthosilane oxide ("TEOS") layer 42. Furthermore, TEOS oxide has a dielectric constant of approximately 4.4, which is outside the recited range of "less than about 3.3" in Claim 1.

The conductive portions 11 and 12 disclosed in the Marty structure are not first and second planar networks of electrical conductors. Rather, Marty discloses that **both** conductive portions 11 and 12 “result from a uniform deposition of a metallization layer....” See Marty, column 3, lines 15–16. Significantly, the conductive portions 11 and 12 **do not** result from separate or distinct metallization depositions. In contrast, the first and second planar networks recited in Claim 1 result from distinct metallization depositions. For example, in referring to the embodiment illustrated in FIGURE 11, the Specification teaches that, after chemical mechanical planarizaiton (“CMP”) of a first metal deposition, “the integrated circuit can then be completed, for example, by the addition of further wiring layers (if necessary) and final passivation.” See paragraph [0064] of the specification.

In view of the foregoing, Applicant submits that Marty does not anticipate Claim 1, and therefore respectfully suggests that Claim 1 is allowable over Marty. Furthermore, because Claims 2 and 4 depend from Claim 1, Applicant submits that Claims 2 and 4 are allowable over Marty for the same reasons that Claim 1 is allowable over Marty, in addition to reciting further distinguishing features of particular utility.

Likewise, Applicant has amended Claim 5 to recite:

Claim 5: An integrated circuit comprising:

a first planar network of electrical conductors formed in a first deposition process, and providing a first electrical path of the circuit;

a second planar network of electrical conductors formed in a second deposition process, and providing a second electrical path of the circuit, the second planar network separated from the first planar network by a gap; and

an interlevel dielectric material **directly contacting** the first and second planar networks, **filling the gap between the first and second planar networks**, and extending into a portion of the first planar network, the interlevel dielectric material comprising polysiloxane, consisting essentially of silicon, oxygen, carbon and hydrogen and incorporating carbon therein and having a dielectric constant of less than about 3.5. *[emphasis added]*

Marty does not teach these limitations. As described above, in the Marty structure the first planar network of electrical conductors (represented by area 1) is separated from the second planar network of electrical conductors (represented by area 2) by **two** distinct dielectric materials: a spun on glass (“SOG”) layer 41, and a tetraethylorthosilane oxide (“TEOS”) layer 42. Furthermore, TEOS oxide has a dielectric constant of approximately 4.4, which is outside the recited range of “less than

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about 3.5" in Claim 5. The conductive portions 11 and 12 disclosed in the Marty structure are not first and second planar networks of electrical conductors for the reasons expounded above.

In view of the foregoing, Applicant submits that Marty does not anticipate Claim 5, and therefore respectfully suggests that Claim 5 is allowable over Marty. Furthermore, because Claims 6 and 7 depend from Claim 5, Applicant submits that Claims 6 and 7 are allowable over Marty for the same reasons that Claim 5 is allowable over Marty.

Claim Rejections Under § 102(e) based on Aoi.

Claims 1–7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 5,877,080 ("Aoi"). Claims 1 and 5 are independent; Claims 2–4 depend from Claim 1, and Claims 6 and 7 depend from Claim 5.

As characterized by the Examiner, Claim 1 of Aoi discloses upper- and lower-metallization-layers separated by an insulating-film. As recited in Claim 1 of Aoi, the insulating film is formed by mixing "a solution of a particulate silanol condensate having a fluorine-silicon bond with a second solution...." The resulting insulating film has a fluorine-silicon bond. See, for example column 8, lines 36–40 of Aoi, which states that when the resulting interlayer insulating film is analyzed using infrared spectroscopy, an absorption peak corresponding to the fluorine-silicon bond is observed, "confirming the formation of a hybrid film."

In contrast to the structure disclosed in Aoi, Claim 1 recites, among other limitations,

Claim 1: An interconnect structure comprising:

... a single interlevel dielectric material ... comprising a polysiloxane network consisting essentially of silicon, oxygen, carbon and hydrogen and incorporating carbon-silicon bonding and having a dielectric constant of less than about 3.3.

Because the Aoi structure includes a fluorine-silicon bond, Aoi does not teach the above limitation. Applicant thus submits that Aoi does not anticipate Claim 1, and therefore respectfully submits that Claim 1 is allowable over Aoi. Furthermore, because

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Claims 2–4 depend from Claim 1, Applicant submits that Claims 2–4 are allowable over Aoi for the same reasons that Claim 1 is allowable over Aoi.

Likewise, Applicant has amended Claim 5 to recite:

Claim 5: An integrated circuit comprising:

... an interlevel dielectric material ... comprising polysiloxane, consisting essentially of silicon, oxygen, carbon and hydrogen and incorporating carbon therein and having a dielectric constant of less than about 3.5.

Aoi does not teach these limitations. As described above, because the Aoi structure includes a fluorine-silicon bond, Aoi does not teach the above limitation. Applicant thus submits that Aoi does not anticipate Claim 5, and therefore respectfully submits that Claim 5 is in condition for allowance. Furthermore, because Claims 6 and 7 depend from Claim 5, Applicant submits that Claims 6 and 7 are allowable over Aoi for the same reasons that Claim 5 is allowable over Aoi.

Claim Rejections Under § 103(a).

Claims 8–10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Marty in view of U.S. Patent 5,869,379 (“Gardener”) or Aoi in view of Gardner. Claims 8 and 9 depend from Claim 5. Claim 10 has been cancelled.

Gardner does not teach the deficiencies of Marty and Aoi. Moreover, the horizontally separated elements disclosed in Gardner are not analogous to the vertically separated “planar networks” recited by Applicant. Specifically, Applicant has disclosed structures having a reduced dielectric constant without a cap layer, which relates only to vertically separated elements (“planar networks”), and is irrelevant to the horizontally separated elements taught by Gardner. See, for example, paragraphs [0057], [0058] and [0077] of the specification.

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Conclusion.

In view of the foregoing amendments, the Applicants submit that this application is in condition for allowance, and respectfully request the same. If, however, some issue remains that the Examiner feels can be addressed by an Examiner's Amendment, the Examiner is cordially invited to call the undersigned for authorization.

Respectfully submitted,

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Dated: 8 dec 03

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AMEND

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